Chapter 2.2 ASSESSMENT METHODOLOGY

Conventional Parameter Methodology

State and federal law requires DEQ to produce a biennial report on the condition of its waters to Virginia's citizens and the EPA. The waters are evaluated in terms of whether the appropriate designated uses are met. These uses are: 1) wildlife, 2) aquatic life, 3) fish consumption, 4) shellfish harvest, 5) recreation (primary and secondary contact recreation) and 6) drinking water use. DEQ employs the "Percent Method" to assess conventional pollutant impacts in waters for two uses: aquatic life use and recreation use.

Description of the Fixed Rate (Percent) Method

Previous national guidance recommended that states use an assessment method for the 305(b) report based on assumptions about the kind and frequency of data needed to support such an assessment. The object is to indicate whether waters are fully supporting or impaired for the designated uses and ultimately for the assessment unit (AU). A 10.5% exceedence threshold is used for determining full support or impairment for conventional pollutants. An exceedence rate that is > 10.5% with at least 2 exceedences is considered impaired.

In effect, the fixed rate assessment guidelines imply that an exceedence of a conventional numeric criterion in 10.5% of the samples taken does not impair the aquatic life designated use due to the ability to recover from short term exceedences of conventional parameters. This is due to many variables associated with sampling errors and/or weather factors that can cause periodic exceedences but not affect designated uses. The rule of thumb is described in Table 2.2-1.

Table 2.2-1 Fixed Rate Assessment Guidelines

Violation Rate (AR) of Total Samples Analyzed	Assessment
AR ≤10.5%	Meets use (Category 2A, 2B or 2C)
AR > 10.5%	Fails to meet use (impaired) Categories 4A, 5A, 5B, 5C or 5D

In recent years, DEQ has been encouraged to spread its monitoring efforts over more of the State's waters. To achieve this goal with a fixed monitoring budget, the average collection frequency changed from monthly to bimonthly (every two months). This monitoring frequency has been applied to a rotating watershed scheme with approximately 1/3 of the watersheds being monitored bimonthly for a 2-year cycle with all watersheds being monitored within 6 years. The benefit from this change is that more streams and more stream miles can be assessed. The disadvantage is that the data collected from each station are fewer (12 samples/2 years). The data set has become wide geographically but shallow in frequency. Additional monitoring program review and possible update stems from the need for additional monitoring data for Total Maximum Daily Load (TMDL) development.

EPA ASSESSMENT CATEGORIES and VIRGINIA SUBCATEGORIES

FULLY SUPPORTING - Waters are supporting one or more designated uses

- **EPA Category 1 -** Attaining all associated designated uses and no designated use is threatened

  Va Category 1A - waters are attaining all uses and a TMDL has been developed for one or more uses.

- **EPA Category 2 –** Available data and/or other information indicate that some, but not all of the designated uses are supported.

  Va. Category 2A - waters are supporting all of the uses for which they are monitored.

  Va. Category 2B - waters are of concern to the state but no Water Quality Standard exists for a specific pollutant, or the water exceeds a state screening value or toxicity test.

Va. Category 2C - waters are now attaining the use(s) for which they were originally 303(d) listed and the TMDL is EPA approved but other applicable use(s) were not monitored and assessed.

INDETERMINATE - Waters needing additional information.

- **EPA Category 3 -** Insufficient data and/or information to determine whether any designated uses are met.

  Va. Category 3A - no data are available within the data window of the current assessment to determine if any designated use is attained and the water was not previously listed as impaired.

  Va. Category 3B - some data exists but is insufficient to determine support of any designated uses. Such waters will be prioritized for follow up monitoring.

  Va. Category 3C- data collected by a citizen monitoring or other organization indicates water quality problems may exist but the methodology and/or data quality has not been approved for a determination of support of designated use(s). These waters are considered as having insufficient data with observed effects. Such waters will be prioritized by DEQ for follow up monitoring.

  Va. Category 3D - data collected by a citizen monitoring or other organization indicates designated use(s) are being attained but the methodology and/or data quality has not been approved for such a determination.

IMPAIRED - Waters are impaired or threatened but a TMDL is not required.

- **EPA Category 4A -** water is impaired or threatened for one or more designated uses but does not require a TMDL because the TMDL for specific pollutant(s) is complete and US EPA approved.

- **EPA Category 4B -** water is impaired or threatened for one or more designated uses but does not require the development of a TMDL because other pollution control requirements (such as VPDES limits under a compliance schedule) are reasonably expected to result in attainment of the Water Quality Standard by the next reporting period or permit cycle.

- **EPA Category 4C -** water is impaired or threatened for one or more designated uses but does not require a TMDL because the impairment is not caused by a pollutant and/or is determined to be caused by natural conditions.

IMPAIRED - Waters are impaired or threatened and require a TMDL.

- **EPA Category 5 - Waters are impaired or threatened and a TMDL is needed.**

  Va. Category 5A - a Water Quality Standard is not attained. The water is impaired or threatened for one or more designated uses by a pollutant(s) and requires a TMDL (303d list).

  Va. Category 5B - the Water Quality Standard for shellfish use is not attained. One or more pollutants causing impairment require TMDL development.

  Va. Category 5C - the Water Quality Standard is not attained due to "suspected" natural conditions. The water is impaired for one or more designated uses by a pollutant(s) and may require a TMDL (303d list). WQ Standards for these waters may be re-evaluated due to the presence of natural conditions.

  Va. Category 5D - the Water Quality Standard is not attained where TMDLs for a pollutant(s) have been developed but one or more pollutants are still causing impairment requiring additional TMDL development.

Va. Category 5E - effluent limited facilities are not expected to meet compliance schedules by next permit cycle or reporting period.

Va. Category 5F - the WQ Standard is attained for a pollutant(s) with a TMDL and 303(d) delisting approved but the water remains impaired for additional pollutant(s) requiring TMDL development.

- **EPA Category 5M** – the WQ Standard is not attained for mercury primarily due to atmospheric deposition.

CRITERIA TO DETERMINE DEGREE OF USE SUPPORT

Virginia bases its water quality assessment on the ability of the waters to support the associated designated uses. Designated use support is based on the waters meeting the criteria for each use as defined in the numeric and/or narrative Water Quality Standards. The following is a general description of the criteria used to determine the quality of the waters relating to each of the designated uses, and thereby the degree of use support that will be presented in the 2008 305(b)/303(d) Integrated Report. Additional information related to the degree of use support can be found in the 2008 Assessment Guidance Manual.

1. Not Assessed

Waters with no data for any uses or a single sample (conventional data only) relative to aquatic life will not be assessed (Category 3A).

2. Insufficient Information

Waters that have a single exceedence in a small dataset (2-9 samples) are considered insufficient data (Category 3B). Additionally, waters will be classified as insufficient (Category 3B) where professional judgment is not sufficient to determine if a designated use is met. Waters where the data are not QA/QC approved but the data review indicates potential degradation are categorized insufficient but having observed effects (Category 3C). Waters where the data are not QA/QC approved but the assessment results indicate acceptable water quality will be considered insufficient data with no observed effects (Category 3D).

3. Fully Supporting

The following is a description of the types of data and the acceptable criteria used to assess waters as fully supporting designated uses. These waters would be placed in Category 2A or 2C unless all designated uses are fully supporting, upon which the water would be placed in Category 1.

Conventional/Bacteria Parameters:

Waters which are fully supporting designated uses can have up to 10.5% exceedences of WQ Standards for the parameters fecal coliform, E.coli or enterococci bacteria (recreation use), and the conventional parameters dissolved oxygen, temperature, nutrients and pH (aquatic life use) without negatively affecting designated uses. This criterion is based on natural variables which DEQ acknowledges can cause exceedences of these criteria in the 0-10.5% range and still fully support both aquatic life and recreation designated uses. All data assessed as fully supporting must be QA/QC approved.

The WQ Standards (9 VAC 25-260-50) criteria for D.O., pH and Temperature do **not** apply at < 7Q10 flow. 7Q10 is the lowest flow averaged (arithmetic mean) over a period of seven consecutive days that can be statistically expected to occur once every 10 climatic years (a climatic year begins April 1 and ends March 31). Data for these parameters that are from flow conditions below 7Q10 will not be used in the Integrated Report.

Toxic Pollutants:

For toxic pollutant assessment in free-flowing streams, waters where there are one or more samples and no exceedences of aquatic life criteria within a running 3-year period, using grab samples or SPMD data, are considered fully supporting for aquatic life and wildlife use. For public water supply and human health

related criteria in other surface waters, one or more samples and no exceedences during the reporting period, using grab samples or SPMD data, are considered fully supporting for PWS and/or fish consumption use. Additional information on the details of using this approach can be found in Part VI, Section 6.5.3 of the 2008 Assessment Guidance Manual.

For toxic pollutant assessment in estuarine waters, where there are several types of toxic data available, a "weight of evidence" approach has been initiated. Additional information on the details of using this approach can be found in Part VI, Section 6.5.3 of the 2008 Assessment Guidance Manual.

Fish Tissue/Sediment Contamination
Waters with one or more samples recording no exceedences of a toxic fish tissue Water Quality Standard-based TV or TSV found in Appendix E-1 or E-2 or sediment screening values (SVs) found in Appendix F of the 2008 Assessment Guidance Manual are considered fully supporting.

Biological Evaluation:
For free-flowing stream biological community assessment, data for the overall assessment period is rated as not impaired where no biological assemblage (e.g. macro-invertebrates) has been modified beyond the natural range of reference conditions based on the newly adopted Virginia Stream Condition Index (VSCI) or the Coastal Plain Macroinvertebrate Index (CPMI) methodology.

A project to refine the estuarine biological assessment methodology has recently been completed and approved for use by EPA and DEQ. Additional information on this new methodology can be found in Section 6.4.2.3 of the 2008 Assessment Guidance Manual.

Fish Advisories:
Waters where the VDH has not issued any fish advisories or prohibitions.

Shellfish Advisories:
Those growing areas where no restriction or prohibition (condemnation) on shellfish harvesting is imposed as indicated by the Department of Shellfish Sanitation (DSS) summary dated January, 2007.

Beach Closures/Advisories:
No VDH beach closures and/or geometric mean exceedences, based on QA/QC approved sampling data, during the assessment period.

Public Water Supply Source Closures:
No VDH public water supply source closures based on sampling data during the assessment period.

4. Fully Supporting but Having an Observed Effect

The following is a description of the types of data and the acceptable criteria used to assess waters as fully supporting but having an observed effect for a designated use(s). It is the intent of the agency to focus additional monitoring resources on the waters that are identified as having an observed effect, based on initial monitoring data analysis. These waters would be placed in the federal Category 2 and the Virginia Subcategory of 2B.

Conventional Screening Parameters:
Free-flowing waters that 1 or more exceedences for sediment and/or toxicity test are considered fully supporting but having an observed effect for aquatic life use (Category 2B). This designation is due to the lack of a Water Quality criterion for these parameters. nce of a bacteria geometric mean will be considered fully supporting with observed effects (Category 2B).

Toxic Pollutants:
For toxic pollutant assessment in free-flowing streams, a single exceedence of aquatic life criteria within a 3-year period, using grab samples or SPMD data, is considered fully supporting but having an observed effect for aquatic life and wildlife. For public water supply use or human health criteria in other surface waters, a single exceedence is considered fully supporting but having an observed effect for PWS and fish consumption use.

For toxic pollutant assessment in estuarine waters, where there are several types of toxic data available, a "weight of evidence" approach has been initiated. If no additional toxic data is available, the water would be assessed the same as the free-flowing waters.

Fish Tissue/Sediment Contamination:
Waters with a single exceedence of a WQ Standards-based TV or TSV found in Appendix E-1 or E-2 from one or more samples for fish tissue or SPMD, or an exceedence of a SV for sediment found in Appendix F of the 2008 Assessment Guidance Manual, are fully supporting but having an observed effect for fish consumption and aquatic life, respectively.

Biological Evaluation:
VSCI or CPMI assessment scores below the impairment threshold but the biologist's best professional judgment has determined a lack of confidence in the biological survey due to natural conditions is considered fully supporting with observed effects. If impairment was discovered from the last 2 samples, a documented justification for not assessing as impaired is expected. Another biological assessment should be scheduled to make a final aquatic life use determination for waters assessed as fully supporting but having an observed effect for aquatic life use.

The use of the previous EPA accepted estuarine (B-IBI) biological assessment methodology has been continued for 2008.

Fish Advisories:
A VDH fish consumption advisory, where a general advisory has been issued but fish consumption is not limited, are considered fully supporting but having an observed effect. This would include the kepone advisory for the tidal James River.

Shellfish Advisories:
Those growing areas, as indicated by the DSS summary dated January, 2007, that have been classified as conditionally approved (seasonal condemnations) are considered fully supporting but having an observed effect.

Beach Closures/Advisories:
A single geometric mean exceedence and/or one short term (less than one week in duration) beach closure and/or two short term (less than one week in duration) swimming advisories due to bacteria contamination, that, based on QA/QC approved data within the 6-year assessment cycle, have a low probability that the pollution will recur (based on best professional judgment) are considered fully supporting with observed effects. Best professional judgment decisions will be based on scientific data indicating the source of the pollution causing the closure/advisory is transient and there are no plans to implement pollution reduction measures or other controls, or documentation shows that mitigation has occurred and the two most recent years of water quality data, subsequent to the mitigation, show an improvement that fully supports the designated use.

Public Water Supply Source Closure:
One short term VDH public water supply source closure during the 6-year assessment cycle with a low probability that the pollution will recur is considered fully supporting but having an observed effect. The source of the pollution is generally transient and there are no VDH plans to implement pollution reduction measures or other controls.

Other Criteria for Waters having Observed Effects
Waters for which "evaluated" data, trend analysis for parameters with no WQ Standards but with screening criteria, or other water quality indicators appear to indicate an apparent effect on designated use(s) or a potential for water quality problems are considered to have "observed effects". Waters can be designated as having observed effects where there is a possible loss of a designated use documented by ancillary data such as fish kills with unknown causes and/or pollution potential documented by non QA/QC approved non-agency studies or reports. These waters are considered insufficient data with observed effects (Category 3C). For monitoring purposes, waters with observed effects should be

considered in the next regional monitoring plan for additional or continued monitoring during the next reporting period as resources allow.

5. **Pollutant Caused Impaired or Threatened Waters Not Needing a TMDL**

Impaired or threatened waters not needing a TMDL are those waters that are listed in the federal Category 4. These are waters that are impaired but an EPA-approved TMDL has been developed and approved by EPA (Category 4A), waters where other pollutant control requirements are reasonably expected to result in attainment of designated use(s) (Category 4B) and waters that are naturally impaired (Category 4C).

6. Pollutant Caused Impaired or Threatened Waters Needing a TMDL

The following is a description of the types of QA/QC-approved data and the acceptable criteria used to assess waters as impaired or threatened for the designated uses. Those waters impaired or threatened by pollutant(s) and needing a TMDL are included in the 303(d) list. These waters are placed in the federal Category 5 (needing a TMDL) and the Virginia sub-categories of 5A, 5B, 5D and possibly 5C and 5E.

Conventional Parameters:

Waters with long-term or chronic pollutant-related problems based on the assessment of monitored data are considered impaired and needing a TMDL. For conventional parameters, at least two exceedences of WQ Standards and exceedences >10.5% are considered long-term or chronic problems and are considered impaired and needing a TMDL. Additionally, waters with 2 or more exceedences of a monthly geometric mean analysis are considered impaired. Geometric mean analysis is normally associated with the BEACH monitoring program conducted by VDH but also could be associated with a designed, multiple sample per month, bacteria special study.

Toxic Pollutants:

For toxic pollutant assessment in free-flowing streams, waters where there are 2 or more exceedences of the same WQ Standards acute aquatic life toxic criteria in a running 3-year period using grab samples or SPMD data are considered impaired for aquatic life use and wildlife use. For public water supply or human health criteria in other surface waters, 2 or more exceedences of the same criteria within the reporting period using grab samples or SPMD data are considered impaired and needing a TMDL for PWS or fish consumption use.

For toxic pollutant assessment in estuarine waters, where there are several types of toxic data available, a “weight of evidence” approach has been initiated.

Fish Tissue Contamination:

Waters exceeding the same toxic human health criteria-based tissue value (TV), listed in Appendix E-1 of the 2008 Assessment Guidance Manual, 2 or more times are impaired for fish consumption. For example, the following situations would qualify as impaired under these guidelines:1) two or more tissue samples from different fish species exceeding the same TV during one sampling event; or 2) two or more samples of the same or different species exceeding the same TV from different sampling events within the assessment period.

Biological Data:

For free-flowing waters, the biological community VSCI or CPMI survey data are confirmed to be moderately or severely impaired, are considered impaired and needing a TMDL. Based on professional judgment and/or other supplemental data, a second survey may be required to confirm moderate impairment and pollutant related causes. In this case, the initial assessment would be considered fully supporting but having an observed effect and follow-up monitoring scheduled.

Fish Advisories:

Virginia Department of Health (VDH) fish consumption prohibitions and/or advisories, where fish consumption is specifically limited, are considered non attainment of the designated use WQ Standard and therefore considered impaired and needing a TMDL.

Shellfish Advisories:

Those growing areas, as indicated by the DSS summary dated January, 2007, that have been classified as prohibited or restricted (condemnations) based on bacteria data are considered impaired and needing a TMDL. Restricted areas that have been administratively condemned due solely to the presence of a VPDES permitted outfall or administrative closure where no data is available will not be assessed as the shellfish use has been administratively removed.

Beach Closures/Advisories:
Two or more geometric mean exceedences, one or more beach closures of one week or more duration, or two or more swimming advisories of one week or more duration due to bacteria contamination, and, based on QA/QC approved data within the assessment cycle, there is a medium to high probability that the closure/advisory will recur (based on best professional judgment) are considered impaired and needing a TMDL.

Public Water Supply Source Closure:
One or more VDH public water supply source closures within the assessment cycle with a medium to high probability that the pollution will recur are considered impaired and needing a TMDL. There are plans to implement pollution reduction measures or controls.

Bay Criteria
One or more Bay criteria exceedences are considered impaired and needing a TMDL for aquatic life use.

Table 2.2-2 summarizes the designated use assessment criteria.

Table 2.2-2 Designated Use Assessment Criteria

	Fully Supporting **Category 1, 1A, 2A, or 2C**	**Fully Supporting or Insufficient data but Having Observed Effects** **Category 2B or 3C**	**Impaired or Threatened Waters Needing a TMDL** **Category 5A, 5B, 5C, 5D or 5F (Impaired with TMDL Approved = Category 4A)**
Conventional Parameters Aquatic Life Use Support (ALUS) and Recreational Use (temperature will not be assessed in tidal waters)	2 or more samples and AR ≤10.5% Meeting all Bay criteria and goals	**Non QA/QC approved** with exceedences > 10.5% (1 exceedence in a small dataset (2-9 samples) **Meeting** some Bay criteria but insufficient data for all criteria assessment	2 or more exceedences and AR > 10.5% of total samples Bay criteria exceedences above the associated criteria reference condition or Bay criteria goal
Toxic Pollutants in Water Column and/or Sediment Aquatic Life Use Support (ALUS) and Wildlife Use	One or more samples and no exceedences	A single grab or SPMD sample exceedence of an acute aquatic life criteria or 1 or more grab sample exceedences of the same chronic aquatic life criteria in a 3 year period (water column only) (ALUS & Wildlife) One or more toxicity test or SV exceedences (sediment only) (ALUS)	2 or more grab sample or SPMD exceedences of the same acute aquatic life criteria in a 3-yr period (water column only) (ALUS & Wildlife) Failing the "weight of evidence" toxicity evaluation (Section 6.5.3)
Toxic Pollutants related to human health, (PWS, & Fish Consumption)	One or more samples and no exceedences	A single exceedence of a human health criteria using grab sample or SPMD data within a 3-year period (PWS and/or fish consumption) A single exceedence of any toxic WQS TV or TSV, listed in Appendix E-1 or E-2 (fish consumption)	2 or more exceedences of the same human health criteria using grab samples or SPMD data within a 3-year period (PWS and/or fish consumption) 2 or more exceedences of the same toxic WQS TV, listed in Appendix E-1 (fish consumption)
Biological Data	Freshwater: VSCI or CPMI assessment scores above the impairment threshold score	Freshwater: VSCI or CPMI assessment scores below the impairment threshold where biologist's best professional judgment has determined a lack of confidence in the biological survey due to natural conditions Estuarine: See Section 6.4.2.2 for additional information.	Freshwater: VSCI or CPMI assessment scores below the impairment threshold score Estuarine: See Section 6.4.2.2 for additional information.
Fish Consumption Advisories or Restrictions	No restrictions or prohibitions	A VDH advisory which does not limit consumption is in effect	A VDH advisory or restriction limiting or prohibiting consumption is in effect
Shellfish Advisories	No restrictions or prohibitions	Area classified as Conditionally Approved (seasonal condemnations)	Areas classified as Restricted or Prohibited: Excluding VPDES out-falls
Recreation Use (see Conventional Parameter criteria) and Beach Closures/Advisories	No geometric mean exceedences or beach closure	One geometric mean exceedence and/or one short term (< 1 week) closure/advisory due to QA/QC-approved bacteria data with low probability of recurrence (pollution source transient)	2 or more exceedences of a geometric mean and/or 1 or more closure and/or 2 or more advisories > 1 week duration due to QA/QC approved bacteria data with medium or high probability of recurrence
Public Water Supply (PWS) Source Closures	No closures based on sampling data	One VDH closure based on QA/QC-approved data with low probability of recurrence	One or more VDH closure based on QA/QC-approved data with medium or high probability of recurrence

AR = arithmetic exceedence rate
SV = screening value
ALUS = Aquatic Life Use Support
PWS = Public Water Supply